

CLAIMS

1. An expanding method for expanding an adhesive sheet with respect to a plate-like article stuck to said adhesive sheet, mounted to a ring-shaped frame through said adhesive sheet, and diced into individual chips, after the dicing to increase spacings between said individual chips, comprising:
 - an expanding step of expanding said adhesive sheet with said plate-like article being mounted to said frame; and
 - an expansion maintaining step of maintaining an expanded state of said adhesive sheet with said plate-like article being mounted to said frame after said expanding step, wherein said plate-like article is able to be conveyed together with said frame with the increased spacings between said chips being maintained.
2. The expanding method according to claim 1, wherein said expanding step includes a step of heating and stretching said adhesive sheet.
3. The expanding method according to claim 1, wherein said expanding step includes a step of forming a protrusion in a portion of said adhesive sheet between said frame and said plate-like article, and
 - said expansion maintaining step includes a step of welding or bonding a base of said protrusion of said adhesive sheet.
4. The expanding method according to claim 3, wherein said base of said protrusion formed in said adhesive sheet is ultrasonically welded.
5. The expanding method according to claim 1, wherein that said expanding step is performed with said plate-like article being placed on a chuck stage of a dicing device, and includes a step of temporarily maintaining the expanded state of said adhesive sheet on said chuck stage using a clamping member, and
 - said expansion maintaining step includes a step of forming a loose part outside said clamping member of said adhesive sheet to pinch and secure a base of said loose part of said adhesive sheet.
6. The expanding method according to claim 5, wherein that said expanding step is performed in a dicing area of said dicing device after the dicing of said plate-like article, and

includes a step of conveying said plate-like article with the expanded state of said adhesive sheet being temporarily maintained together with said chuck stage to a different area in the same device, and

said expansion maintaining step is performed in said different area.

5 7. The expanding method according to claim 5, wherein said expanding method further comprises a step of conveying said plate-like article together with said chuck stage of said dicing device to a different area in the same device without being detached from said chuck stage after the dicing of said plate-like article, and

10 said expanding step and said expansion maintaining step are performed in said different area in the same device.

8. The expanding method according to any one of claims 5, 6 and 7, wherein said expansion maintaining step includes a step of securing said base of said loose part of said adhesive sheet by welding or bonding.

9. The expanding method according to claim 1, wherein a heat-shrinkable sheet is used as said adhesive sheet, and

said expanding step and said expansion maintaining step are simultaneously performed by heating said adhesive sheet in at least a pair of areas sandwiching said plate-like article in parallel with a dicing line of said plate-like article in the portion of said adhesive sheet between said plate-like article and said frame.

20 10. The expanding method according to claim 9, wherein said adhesive sheet is heated in at least a pair of areas sandwiching said plate-like article in parallel with a dicing line in one direction of said plate-like article, and in at least a pair of areas sandwiching said plate-like article in parallel with a dicing line perpendicular to the dicing line in said one direction, and

25 heating temperatures of said areas are individually controlled according to the state of increase in the spacings between said individual chips.

11. The expanding method according to claim 9 or 10, wherein after the dicing of said plate-like article, said adhesive sheet is heated without said plate-like article being detached from the chuck stage of the dicing device.

30 12. The expanding method according to claim 1, wherein a heat-shrinkable sheet is used as said adhesive sheet,

said expanding step includes a step of applying tension to said adhesive sheet, and

said expansion maintaining step includes a step of forming a loose part in a portion of said adhesive sheet between said plate-like article and said frame, and heating and shrinking said loose part to eliminate said loose part.

13. The expanding method according to claim 12, wherein said loose part is formed
5 after the expanded state of said adhesive sheet in the portion on which said expanded plate-like article is stuck is maintained by suction or mechanically, and

said maintenance by suction or mechanical maintenance is released after said loose part is heated and shrunk.

14. The expanding method according to claim 12 or 13, wherein said plate-like article
10 and said frame are relatively separated to expand said adhesive sheet, and

the relative separation between said plate-like article and said frame is terminated to form said loose part.

15. The expanding method according to claim 12 or 13, wherein said adhesive sheet is pressed between said plate-like article and said frame to expand said adhesive sheet, and
15 the press of said adhesive sheet between said plate-like article and said frame is released to form said loose part.

16. The expanding method according to any one of claims 12, 13, 14 and 15, wherein a portion of said adhesive sheet outside said plate-like article is heated in a ring shape to shrink said loose part.

20 17. The expanding method according to any one of claims 12, 13, 14, 15 and 16, wherein after the dicing of said plate-like article, said adhesive sheet is expanded without said plate-like article being detached from the chuck stage of the dicing device.

18. The expanding method according to claim 1, wherein said expanding step includes a step of relatively vertically separating said plate-like article and said frame, and
25 applying a lateral force to said adhesive sheet, and

said expansion maintaining step includes a step of sticking a different ring-shaped frame to said expanded adhesive sheet, and cutting said adhesive sheet near an outer periphery of said different frame.

19. The expanding method according to claim 18, wherein said lateral force applied to
30 said adhesive sheet is applied by inflating an airbag.

20. The expanding method according to claim 18 or 19, wherein said frame and said different frame are of the same type.

21. An expanding device for expanding an adhesive sheet with respect to a plate-like article stuck to said adhesive sheet, mounted to a ring-shaped frame through said adhesive sheet, and diced into individual chips, after the dicing to increase spacings between the individual chips, comprising:
- 5 expanding means for expanding said adhesive sheet with said plate-like article being mounted to said frame; and
- expansion maintaining means for maintaining an expanded state of said adhesive sheet with said plate-like article being mounted to said frame after said expansion,
- wherein said plate-like article is able to be conveyed together with said frame with
- 10 the increased spacings between said chips being maintained.
22. The expanding device according to claim 21, wherein said expanding means includes a heating stage on which said plate-like article is placed together with said adhesive sheet, and a heater incorporated into said heating stage,
- said expansion maintaining means includes an inner ring having an inner diameter
- 15 larger than an outer diameter of said plate-like article, and an outer ring having an inner diameter that is able to be firmly fitted over an outer periphery of said inner ring through said adhesive sheet, and
- said expanding device is adapted so that a portion of said adhesive sheet on which
- said plate-like article is stuck is heated by said heating stage, said adhesive sheet is
- 20 stretched toward an outer periphery thereof and expanded, and a portion outside the
- heated portion of said adhesive sheet is sandwiched between said inner ring and said
- outer ring to maintain the expanded state of said adhesive sheet.
23. The expanding device according to claim 21, wherein said expanding means
- includes a chuck stage on which said plate-like article is placed, and a pressure member
- 25 that presses a portion of said adhesive sheet between said frame and said plate-like article
- to form a protrusion in said adhesive sheet,
- said expansion maintaining means includes a housing that is placed so as to face
- said pressure member through said adhesive sheet and has a space for said protrusion,
- and a welding tool to be pressed toward a base of said protrusion,
- 30 said protrusion is formed in said adhesive sheet by said pressure member to
- expand said adhesive sheet, and

- said base of said protrusion is welded by said welding tool to maintain the expanded state of said adhesive sheet.
24. The expanding device according to claim 23, further comprising:
pressure reducing means for reducing pressure in said space in said housing.
- 5 25. The expanding device according to claim 21, wherein said expanding means expands said adhesive sheet without said plate-like article being detached from the chuck stage of the dicing device after the dicing of said plate-like article,
sheet securing means for temporarily maintaining the expanded state of said adhesive sheet on said chuck stage is provided,
- 10 conveying means is provided for conveying said plate-like article together with said chuck stage from a dicing area to a different area in said dicing device with the expanded state of said adhesive sheet being temporarily maintained, and
said expansion maintaining means is provided in said different area, and pinches and secures a base of a loose part that is formed in a portion of said adhesive sheet where 15 the expanded state is not maintained.
26. The expanding device according to claim 21, wherein conveying means is provided for conveying said plate-like article together with the chuck stage of the dicing device from a dicing area to a different area in said dicing device without said plate-like article being detached from said chuck stage after the dicing of said plate-like article,
- 20 said expanding means expands said adhesive sheet in said different area in said dicing device,
sheet securing means for temporarily maintaining the expanded state of said adhesive sheet on said chuck stage is provided, and
said expansion maintaining means pinches and secures a base of a loose part 25 formed in a portion of said adhesive sheet where the expanded state is not temporarily maintained.
27. The expanding device according to any one of claims 23, 24, 25 and 26, wherein said expansion maintaining means includes an ultrasonic welding tool.
28. The expanding device according to claim 21, wherein for said heat-shrinkable 30 adhesive sheet,
said expanding means and said expansion maintaining means include heating means for heating said adhesive sheet in at least a pair of areas sandwiching said

plate-like article in parallel with a dicing line in one direction of said plate-like article, and in at least a pair of areas sandwiching said plate-like article in parallel with a dicing line perpendicular to the dicing line in said one direction.

29. The expanding device according to claim 21, wherein for said heat-shrinkable

5 adhesive sheet, said expanding means includes at least one of means for relatively vertically separating said plate-like article and said frame, and means for pressing said adhesive sheet,

sheet securing means for temporarily maintaining the expanded state of said adhesive sheet is provided, and

10 said expansion maintaining means includes heating means for heating a loose part formed in a portion of said adhesive sheet between said plate-like article and said frame.

30. The expanding device according to claim 21, wherein said expanding means includes means for relatively vertically separating said plate-like article and said frame to stretch said adhesive sheet, and an air bag that is inflated by compressed air to apply a

15 lateral force to said adhesive sheet, and

said expansion maintaining means includes means for sticking a new frame to said expanded adhesive sheet, and means for cutting said adhesive sheet along an outer periphery of said new frame.